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1. Session: DENVER96 (Linda horn) Cassini/Huygens: A mission to the Saturnian System

2. Title: The IIRG - An IRU for Cassini

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5. Abstract & Oral Presentation: **An IRU for Cassini***

The JPL Inertial Reference Unit (IRU) is the single most sophisticated assembly on the Cassini Spacecraft. At the core of the IRU is the state-of-the-art, Litton (formerly Delco) Hemispherical Resonator Gyroscope (HIRG). Launched in October of 1997, Cassini's trajectory utilizes gravity assist maneuvers around Venus (twice), Earth, and Jupiter over a seven year period, arriving at the Saturn system in June of 2004." Its tour of the Saturn system will last an additional four years. Although the Cassini Star Reference Unit (SRU) provides the ultimate reference for the spacecraft Attitude and Articulation Control System (AACS) and can be used to control the spacecraft under benign conditions, the Cassini Inertial Reference Unit (IRU) will be essential for precision attitude stabilization and during maneuvers and fault recovery operations. The reliability of the IRU over the long Cassini mission is therefore of critical concern,

Following an extensive evaluation of several possible alternatives the Hemispherical Resonator Gyro (HIRG) based IRU, developed by Litton Guidance and Control Systems, was chosen for the Cassini mission. The Hemispherical Resonator Gyro (HIRG) offers an attitude sensor that has no physical wearout mechanisms, based on a principle first described by G. H. Bryan in 1890 in his paper "on Beats in the Vibrations of a Revolving Cylinder or Bell". Modifications to the basic HIRG IRU design were made to adapt it to the unique requirements of the Cassini mission and the AACS interface. The Cassini IRU **will be the** first use of an IRU for a deep space planetary mission that does not use a spun mass sensor,

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6. Key Words: Cassini Mission, Inertial Reference Systems, Hemispherical Resonator Gyro, HIRG.